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SPECIFICATION FOR CARGO HANDLING NETS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

May 1986

Indian Standard

SPECIFICATION FOR CARGO HANDLING NETS

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SPECIFICATION FOR CARGO HANDLING NETS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 November 1985, after the draft finalized by the Cordage Sectional Committee had been approved by the Textile Division Council.

0.2 The safe use of cargo handling nets is of utmost importance from the user's point of view. The cargo handling nets are manufactured from only polyamide and polypropylene ropes as these ropes possess good shock absorption properties and are hence safe for cargo lifting purposes, whereas other synthetic fibre ropes, such as high density polyethylene ropes and natural fibre ropes are not suitable for manufacturing cargo handling nets due to the absence of desired shock absorption properties.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements of cargo handling nets made from polyamide and polypropylene ropes and designed to lift material from and into ships, etc. Recommendations on the care of nets have been given in Appendix B of this standard.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

---

*Rules for rounding off numerical values (*revised*).

2.1 Mesh Cord — Cord or rope from which the mesh of the net is constructed.

2.2 Border Cord — The cord or rope surrounding the net and determining the overall dimensions of the net.

2.3 Hands — The ropes attached to the border cord at the corners of the net by which the net is lifted.

2.4 Mesh Side — The distance between two sequential knots or joints measured from centre to centre when the cord between these joints is fully extended.

2.5 Nominal Size — The overall dimensions of the net when laid evenly on a flat surface in a relaxed condition and without any tension on the border cords.

3. MATERIAL

3.1 The cargo lifting nets shall be made from man-made fibre ropes, either polyamide as per IS : 4572 (Part 2)-1983* or polypropylene rope as per special Grade of IS : 5175-1982†. The choice of the material shall be determined by the circumstances in which the nets are to be used, the purpose and the prevailing conditions, etc.

4. CONSTRUCTION

4.1 Safe working loads are chosen in accordance with the following basic principles:

a) The basic safety factor for polyamide ropes is 9 and the basic safety factor for polypropylene ropes is 6.

b) The safe working load of a net has been calculated from the formula, as follows:

$$\text{Safe working load of net} = \frac{0{\cdot}67\,(V+H)\times\text{specified breaking load of mesh rope}}{4\times\text{basic safety factor of the rope}}$$

where

V = number of vertical mesh cords, and

H = number of horizontal mesh cords.

This formula for safe working load of a net is applicable when a number of small parcels have to be lifted.

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*Specification for polyamide multifilament ropes : Part 2 Hawser-laid ropes for specific applications (*second revision*).

†Specification for polypropylene ropes (3-strand hawser laid and 8-strand plaited) (*first revision*).

4.2 Design

4.2.1 The net shall have nominally square construction, in which the length of its vertical mesh cord should be equal to the length of its horizontal mesh cord.

4.2.2 Nets shall be made with a square mesh and the length of the mesh side shall not be greater than 30 cm.

4.2.3 Nets may be constructed as per the following three methods:

a) Woven	—	As shown in Fig. 1
b) Tucked	—	As shown in Fig. 2
c) Knotted	—	As shown in Fig. 3

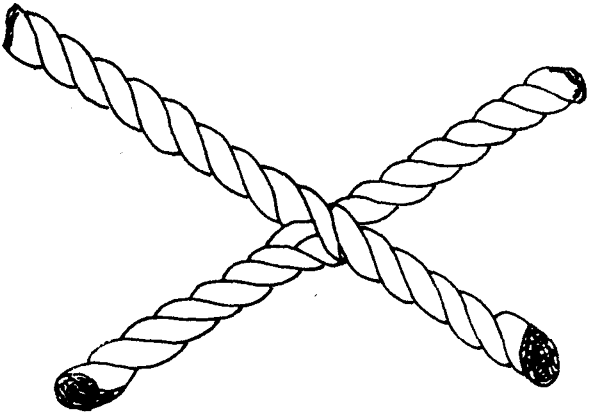

FIG. 1 WOVEN

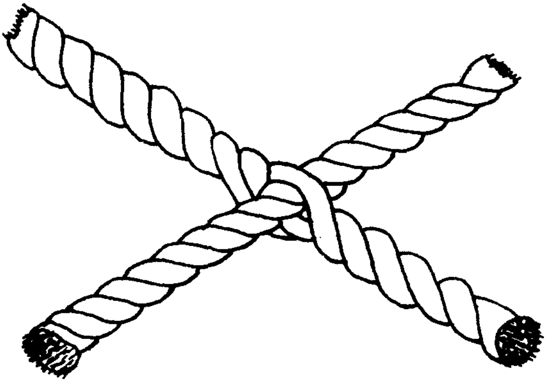

FIG. 2 TUCKED

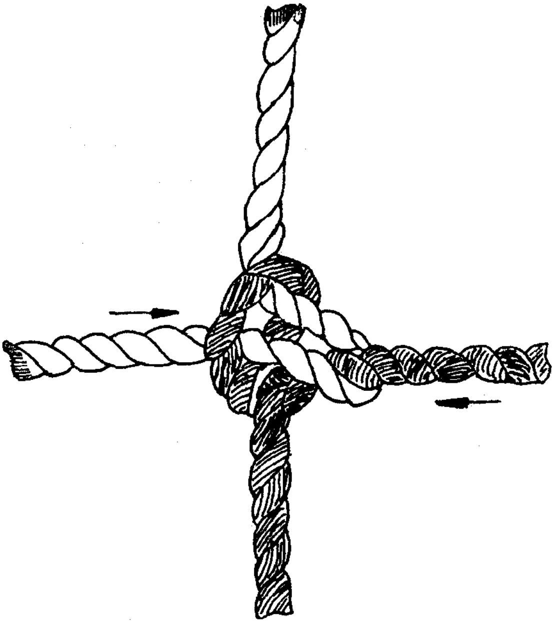

FIG. 3 KNOTTED

However, the safe working load for nets manufactured as per the construction method (b) and (c) shall have a safe working load of 50 percent of that calculated by the formula mentioned in item **4.1**(b).

4.2.4 Border cords and the hands shall have a diameter of at least 33 percent greater than the mesh cords.

4.2.5 Each net shall be manufactured using rope of only one type of material, that is, either polyamide or polypropylene. Further, each net shall be manufactured in such a way that the mesh cords, border cords and hand rope come from one lot and one rope manufacturer only respectively. Thus the load elongation characteristics of all mesh cords, border cords and hand rope shall be same and the stress concentration on the cords shall be matched.

5. REQUIREMENTS

5.1 The requirements of cargo nets shall be as specified in Table 1. Nets of other designs can be arrived at, at the convenience of the buyer and the seller. However, such net designs and constructions shall be as per **4.1**

and **4.2** when tested as per Appendix A and tolerances on nominal mesh size and 'nominal length of hands' shall be ± 10 percent. The nets shall also meet the proof load requirement when tested as per **A-3**.

6. PACKING

6.1 All nets shall be neatly folded and suitably packed to prevent damage during transportation. IS : 3256-1980* may be followed as regards the packing and stitching materials.

7. MARKING

7.1 Each net shall have securely attached two labels on the border cords carrying the following information:

a) Nominal size of the net,

b) Nominal mesh size,

c) Diameter of mesh cord, border cord and hand rope,

d) Safe working load of the net written boldly in capitals, and

e) Manufacturer's name and trade-mark.

7.1.1 The net may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8. SAMPLING

8.1 Lot

8.1.1 The quantity of nets of the same nominal size, nominal mesh size, length of hands, type and size of rope manufactured under similar conditions and delivered to a buyer against a despatch note shall constitute a lot.

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*Code for inland packaging of ropes and cordages (*first revision*).

TABLE 1 REQUIREMENTS OF CARGO HANDLING NETS

(*Clause* 5.1)

SL No.	NOMINAL SIZE OF NET	NOMINAL SIZE OF MESH	NOMINAL LENGTH OF HANDS	NO. OF MESH CORDS		SIZE OF ROPE (IN DIAMETER)		SAFE WORKING LOAD OF NET WOVEN TYPE kN
				Vertical	Horizontal	Mesh Cords	Border Cord and Hand Rope	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	m	mm	m			mm	mm	
i)	3 × 3	125 × 125	1·50	23	23	12	16	25·48
ii)	3·6 × 3·6	125 × 125	1·80	27	27	12	16	29·40
iii)	3 × 3	225 × 225	1·50	12	12	20	28	35·28
iv)	3·6 × 3·6	225 × 225	1·80	15	15	20	28	44·10
v)	3·6 × 3·6	200 × 200	1·80	17	17	20	28	49·98
Toler-ance	± 10 percent	± 10 percent	± 10 percent	—	—	—	—	—
Method of Test	Appendix A		Appendix A					Appendix A (*See* Note 1)

NOTE 1 — The cargo net shall be proof loaded to 125 percent of its specified safe working load as per Appendix A, that is, the proof load on a cargo net with safe working load of 25·48 kN is 31·85 kN.

NOTE 2 — A cargo net of any design and safe working load shall be acceptable as long as it is manufactured as per this specification, its safe working load calculated as per the formula given in **4.1** and tested as per Appendix A as declared by the manufacturer.

NOTE 3 — 1 kN = 102 kgf approximately.

8.2 Sample Size

8.2.1 Sampling shall be as representative as possible of the lot subjected to the measurements and tests. The sample shall be drawn at random at the rate shown by the following formula:

$$S = 0{\cdot}4\sqrt{N}$$

where S is the number of nets to be drawn for sampling and N is the number of size of the lot expressed in number of nets. When S is calculated and is not a whole number, it is rounded off and the value obtained is given a whole number in accordance with the requirement of IS : 2-1960*. In case where S is less than 1 draw one sample net for testing.

APPENDIX A

(*Clause* 5.1 and *Table* 1)

METHOD OF TESTING

A-1. DIMENSIONS

A-1.1 The specimen cargo nets shall be unfolded and spread on the floor. Initial tension shall be applied by pulling on the hands and then the net shall be allowed to relax on the floor for 3 minutes.

A-1.2 The length and width of the net shall be measured from centre to centre of the border cords. The length of the hands shall be measured from one end of its eye to the other end (as shown in Fig. 4).

A-1.3 Three meshes shall be measured per net, of which at least one shall be near the centre of the net and at least one shall be at the edge of the net. The distance between two sequential knots or joints in the vertical and in the horizontal side measured from centre to centre shall give the two dimensions of the mesh.

A-2. BREAKING STRENGTH OF ROPE

A-2.1 Polyamide Rope — of the same size as the border cords and mesh cords, declared by the manufacturer to be coming from the same lots used for fabricating the nets shall be tested as per the requirements laid down in IS : 4572 (Part 1)-1982† and IS : 4572 (Part 2)-1983‡.

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*Rules for rounding off numerical values (*revised*).

†Specification for polyamide multifilament ropes : Part 1 General requirements for hawser-laid and plaited ropes (*second revision*).

‡Specification for polyamide multifilament ropes : Part 2 Hawser-laid ropes for specific applications (*second revision*).

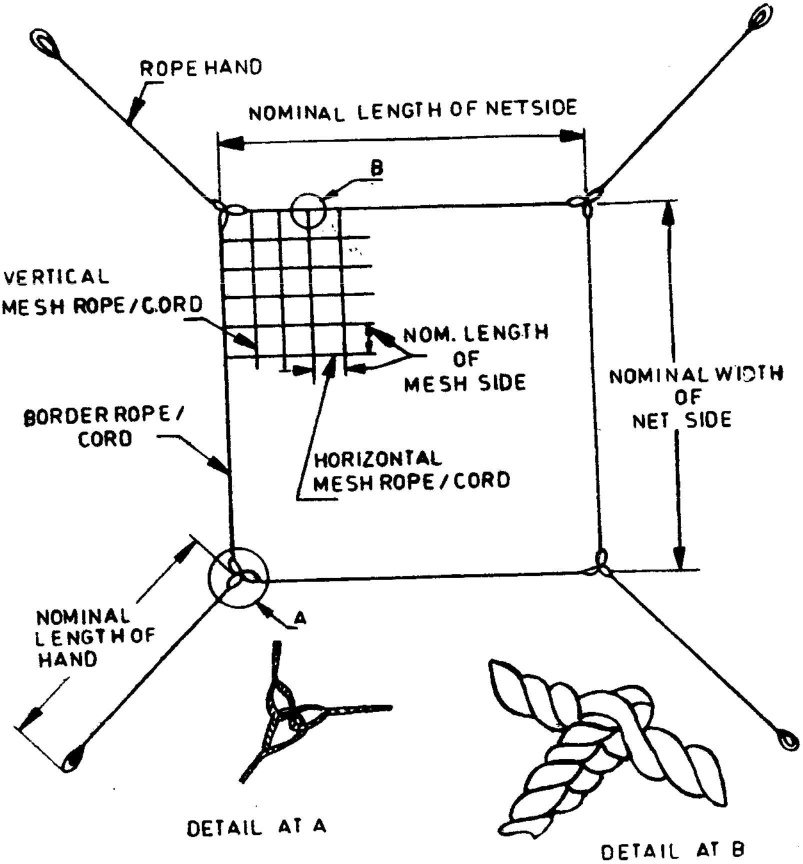

Fig. 4 Cargo Handling Net

A-2.2 Polypropylene Rope — Polypropylene rope of the same size as the border cords and mesh cords, declared by the manufacturer to be coming from the same lots used for fabricating the nets shall be tested as per the requirements laid down in IS : 5175-1982*.

A-2.3 It is imperative that each net shall be made out of the same type of rope and from the same lot (*see* **4.2.5**). In case of any doubt the rope manufacturer should be asked to certify the same.

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*Specification for polypropylene ropes (3-strand hawser-laid and 8-strand plaited) (*first revision*).

A-3. PROOF LOAD

A-3.1 The specimen of cargo net is spread out on the floor. Gunny sacks containing sand and each weighing between 30 and 50 kg are spread uniformly over the mesh cords until a total mass which is 25 percent in excess of the safe working load is reached. The specimen net is then lifted by means of its hands off the floor up to a distance of at least 500 mm.

A-3.2 The net remains suspended for five minutes and is then lowered on the floor and the load removed. This net is then visually examined to check whether any fractures or splice slippages have taken place in the mesh cords, border cords and hands.

A-3.3 A specimen net which has been proof loaded as above and has, after this test, no fractures or splice slippages is deemed to have a safe working load as specified.

APPENDIX B

(*Clause* 1.1)

CARE OF CARGO HANDLING NETS

B-1. GENERAL

B-1.1 Cargo nets made from any material are liable to wear and to mechanical damage, and can be weakened to some extent by various agencies such as chemicals, heat and light. Regular inspection by a competent person is necessary to ensure that the nets are still serviceable.

B-1.2 It should also be emphasized that no matter what agency has weakened the net, the effect will be more serious on smaller size cordage than on the larger size cordage. Consideration should, therefore, be given to the relationship of the surface area of the cordge and cross section.

B-1.3 Inspection should be done by examination of the net in small sections, the cordage being turned to reveal all sides before continuing. At the same time the cordage should where practicable, be opened up to allow for internal examination.

B-1.4 To define a standard of acceptance or rejection is much more difficult than to describe the method of inspection. There can be no well defined boundary between nets that are safe and those that are not, because this depends on the stresses placed on the net in an emergency.

The decision whether to continue to use a net or to take it out of service should be based on an assessment of the general condition of the net. This is necessary because many of the conditions that will guide the competent person cannot be exactly described but only stated in general terms. If, after examination, there should be any doubt about its safety, it should be withdrawn from service. It should again be emphasized that the effects of wear and mechanical damage are relatively great on thinner cordage, which therefore requires more stringent standard of acceptance.

B-2. CAUSES OF DAMAGE

B-2.1 External wear due to dragging over rough surfaces causes filamentation. However, some type of filamentation is in a way effective, as this filamentation protects rope from further abrasion and damage.

B-2.2 Physical cuts on the ropes of cargo nets can take place if the net is handling sharp edged items or comes in contact with other sharp edges. A net which has even one strand of any of its cords completely cut should be discarded immediately.

B-3. SPECIFIC CAUSES OF DAMAGE

B-3.1 Abrasion — Man-made fibre nets have very good abrasion resistance.

B-3.2 Overloading — The resistance of man-made fibre cordage to damage due to repeated overloading is excellent.

B-3.3 Chemical Attack — The chemical resistance of man-made fibre is in general very good and a brief description of the resistance to chemical attacks of the different man-made fibres is given below.

B-3.3.1 Resistance of polyamides to alkalies is good but the resistance to acids is poor. The resistance of the polyolefin (for example, polypropylene) to both acids and alkalies is good.

B-3.3.2 Resistance of man-made fibres to hydrocarbon oils and common organic solvent is good, although certain man-made fibres may swell in some chlorinated solvent. Attack by concentrated phenols on polyamide fibres is severe and contact should be avoided.

B-3.3.3 As a general rule, if acids or alkalis of any concentration are brought into contact with a man-made fabric net, they should not be allowed to dry off and thus concentrate the chemical, but the net should be washed out well and taken out of service. Advice should be taken on the most suitable material if a net is to be used in an environment where chemical contamination is likely.

B-3.3.4 Net should not be subjected to execssive heat, fire or steam and they should not be used where they could be damaged by falling sparks or molten metal from welding equipment.